

1 1. A multimode and multiband MIMO transceiver of W-
2 CDMA, WLAN, and UWB communication comprising:
3 a MIMO-based multimode and multiband RF unit of
4 W-CDMA, WLAN and UWB;
5 a W-CDMA rake and baseband processor;
6 a dual-mode WLAN and UWB OFDM processor;
7 a tri-mode interleaver;
8 a tri-mode coding processor;
9 a sharing memory bank;
10 a tri-mode control processor of W-CDMA, WLAN and
11 UWB;
12 a multiple antenna unit including four identical
13 antennas.

14 2. The multimode and multiband MIMO transceiver of W-
15 CDMA, WLAN, and UWB communication of claim 1, wherein the
16 W-CDMA rake and baseband processor further comprises two
17 digital receiver filters coupled to two down samplings, a
18 MUX, two spreaders, a despreader sequence generator, a rake
19 receiver unit, and a descrambler coder generator.

20 3. The multimode and multiband MIMO transceiver of W-
21 CDMA, WLAN, and UWB communication of claim 2, wherein said
22 two digital receiver filters coupled to two down samplings
23 are equivalent to two decimation filters in which have

24 linear phases and symmetric filter coefficients in
25 programmable.

26 4. The multimode and multiband MIMO transceiver of W-
27 CDMA, WLAN, and UWB communication of claim 1, wherein the
28 MIMO-based multimode and multiband RF unit of W-CDMA, WLAN
29 and UWB further comprises four analog bandpass filters,
30 four LNA, four AGC, a sum over block, a selection switch, a
31 W-CDMA down converter and demodulation, a WLAN down
32 converter and demodulation, a multiband UWB down converter
33 and demodulation, and a tri-mode A/D converter unit.

34 5. The multimode and multiband MIMO transceiver of W-
35 CDMA, WLAN, and UWB communication of claim 4, wherein the
36 tri-mode A/D converter unit further comprises:
37 two selection switches with three inputs and one
38 output;
39 each of said two selection switches connects one
40 input of W-CDMA, WLAN or UWB signals;
41 eight A/D converters with uniform frequency
42 sampling rate and resolution;
43 two of said eight A/D converters for W-CDMA mode
44 or WLAN mode;
45 Said eight A/D converters for UWB mode.

46 6. The multimode and multiband MIMO transceiver of W-
47 CDMA, WLAN, and UWB communication of claim 1, wherein the
48 dual-mode WLAN and UWB OFDM processor further comprises:
49 a WLAN digital decimation channel select filter
50 unit;
51 a controllable selection switch with connecting
52 either a WLAN input or an UWB input and producing a serial
53 output;
54 a dual-mode WLAN and UWB serial-to-parallel (S/P)
55 and Guard removing;
56 a dual-mode WLAN and UWB FFT and frequency-domain
57 equalizer (FEQ);
58 a dual-mode parallel-to-serial (P/S) with either
59 64 inputs or 512 inputs in parallel and one serial output;
60 a multiband UWB digital receiver filter,
61 despreading and time-domain equalizer (TEQ) unit;
62 three S/P and guard removing;
63 three FFT and FEQ;
64 three P/S with 512 inputs in parallel and one
65 serial output;
66 a P/S with four inputs in parallel and one serial
67 output;
68 a spreader; and
69 a user key sequence generator.

70 7. The multimode and multiband MIMO transceiver of W-
71 CDMA, WLAN, and UWB communication of claim 6, wherein the
72 dual-mode WLAN and UWB FFT and FEQ further comprises a
73 dual-mode FFT, 500 equalizers, 500 decision detectors, 500
74 subtracts, an adaptive algorithm, and a WLAN/UWB mode
75 generator.

76 8. The multimode and multiband MIMO transceiver of W-
77 CDMA, WLAN, and UWB communication of claim 7, wherein said
78 dual-mode FFT has either 1024 inputs and 500 outputs in
79 parallel for UWB operation or 64 inputs and 64 outputs in
80 parallel for WLAN operation.

81 9. The multimode and multiband MIMO transceiver of W-
82 CDMA, WLAN, and UWB communication of claim 7, wherein said
83 dual-mode WLAN and UWB FFT and FEQ uses the dual-mode FFT
84 with 64 inputs and 64 outputs in parallel, 64 equalizers,
85 64 decision detectors, 64 subtracts, and the adaptive
86 algorithm during WLAN operation.

87 10. The multimode and multiband MIMO transceiver of
88 W-CDMA, WLAN, and UWB communication of claim 7, wherein
89 said adaptive algorithm is a least mean square (LMS), a
90 recursive least squares (RLS) or a constant modulus
91 algorithm (CMA).

92 11. The multimode and multiband MIMO transceiver of
93 W-CDMA, WLAN, and UWB communication of claim 6, wherein the
94 multiband UWB digital receiver filter, despreading and TEQ
95 unit further comprises four signal processing branches in
96 parallel, each of said signal processing braches including
97 two digital receiver filters coupled to two spreaders,
98 which are used to despread input signals with two sequences
99 from a multiband despreading generator, and the outputs of
100 said two spreaders are multiplied by a MUX followed by a
101 TEQ.

102 12. A multimode and multiband MIMO-based W-CDMA,
103 WLAN, and UWB communication receiver comprising:
104 four antennas coupled to a multimode and
105 multiband W-CDMA, WLAN and UWB RF unit;
106 the multimode and multiband W-CDMA, WLAN and UWB
107 RF unit coupled to a W-CDMA rake and baseband processor, a
108 dual-mode WLAN and UWB OFDM processor, a sharing memory
109 bank, and a tri-mode control processor of W-CDMA, WLAN and
110 UWB;
111 said W-CDMA rake and baseband processor, said
112 dual-mode WLAN and UWB OFDM processor, said sharing memory
113 bank, and said tri-mode control processor of W-CDMA, WLAN
114 and UWB coupled to a tri-mode interleaver; and

115 the tri-mode interleaver coupled to a coding
116 processor in which is controlled by said tri-mode control
117 processor of W-CDMA, WLAN and UWB.

118 13. The multimode and multiband MIMO-based W-CDMA,
119 WLAN, and UWB communication receiver of claim 12, wherein
120 the multimode and multiband W-CDMA, WLAN and UWB RF unit
121 further comprises:

122 four analog signal processing branches, each of
123 said analog signal processing branches including an analog
124 bandpass filter coupled to a LNA followed by a AGC, which
125 are summed by a sum over a block followed by a selection
126 switch;

127 said selection switch connects to a W-CDMA down
128 converter and demodulation during a W-CDMA mode or to a
129 WLAN down converter and demodulation during a WLAN mode or
130 to an UWB down converter and demodulation during UWB mode;
131 and

132 said W-CDMA down converter and demodulation, said
133 WLAN down converter and demodulation, and said UWB down
134 converter and demodulation in parallel coupled to a tri-
135 mode A/D converter unit.

136 14. The multimode and multiband MIMO-based W-CDMA,
137 WLAN, and UWB communication receiver of claim 13, wherein
138 said each of said analog signal processing branches,

139 including analog bandpass filter coupled to a LNA followed
140 by a AGC is programmable in parameters and has scalability
141 functions.

142 15. The multimode and multiband MIMO-based W-CDMA,
143 WLAN, and UWB communication receiver of claim 12, wherein
144 the dual-mode WLAN and UWB OFDM processor further
145 comprises:

146 a WLAN digital decimation channel select filter
147 unit coupled to a selection switch followed by a WLAN
148 signal processing branch including a dual-mode WLAN and UWB
149 S/P and guard removing, a dual-mode WLAN and UWB FFT and
150 FEQ, and a dual-mode P/S;

151 said dual-mode P/S having either 64 inputs and an
152 output or 512 inputs and an output;

153 a multiband UWB digital receiver filter,
154 despreading and TEQ unit coupled to said WLAN signal
155 processing branch and three UWB signal processing branches
156 that are combined by a P/S followed by a spreader supported
157 by an user-p key generator; and

158 each of the said UWB signal processing branches
159 including a S/P and guard removing coupled to a FFT and FEQ
160 followed by a P/S.

161

162 16. An article comprising a medium storing
163 instructions adapted to be executed to perform a method
164 that causes a processor-based system to:
165 set the processor-based system in a receiver mode
166 depending on whether received signals belong to W-CDMA,
167 WLAN or UWB; and
168 set the processor-based system to perform a W-
169 CDMA function and to turn off WLAN and UWB functions during
170 W-CDMA mode;
171 set the processor-based system to perform the
172 WLAN function and to turn off the W-CDMA and the UWB
173 functions during WLAN mode; or
174 set the processor-based system to perform the UWB
175 function and to turn off the W-CDMA and the WLAN functions
176 during UWB mode;

177 17. The article of claim 16 further storing
178 instructions that cause a processor-based system during a
179 W-CDMA mode to:
180 set W-CDMA parameters for bandpass filters, LNA
181 and AGC;
182 control a switch to connect with a W-CDMA down
183 converter and demodulation;
184 select two A/D converters out of eight A/D
185 converters for W-CDMA signals; and

186 set W-CDMA parameters for a tri-mode interleaver
187 and a tri-mode decoding.

188 18. The article of claim 16 further storing
189 instructions that cause a processor-based system during a
190 WLAN mode to:
191 set WLAN parameters for bandpass filters, LNA and
192 AGC;
193 control a switch to connect with a WLAN down
194 converter and demodulation;
195 select two A/D converters for WLAN signals; and
196 set WLAN parameters for a FFT and FEQ, the tri-
197 mode interleaver and the tri-mode decoding.

198 19. The article of claim 16 further storing
199 instructions that cause a processor-based system during an
200 UWB mode to:
201 set UWB parameters for bandpass filters, LNA and
202 AGC;
203 control a switch to connect with a UWB down
204 converter and demodulation;
205 select eight A/D converters for UWB signals; and
206 set UWB parameters for a FFT and FEQ, an tri-mode
207 interleaver and a tri-mode decoding.